AVIATION

The Oldest American Aeronautical Magazine

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Westward Ho ! — One of the American World Cruisers in Flight

Photo Badel & Herbert

VOLUME XVI

NUMBER 15

SPECIAL FEATURES

THE AIR MAIL IN ALASKA

BARNSTORMING AND MAKING MONEY

MODERN AIRCRAFT BOMBS AND THEIR USE

FOREIGN ENTRIES FOR SCHNEIDER CUP RACE

GARDNER PUBLISHING CO., Inc.

HIGHLAND, N. Y.

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PUBLISHER'S NEWS LETTER

Our running comment on the present state of the aeronautical industry has brought many interesting side lights. One aircraft manufacturer writes:

"At this writing our factory is virtually closed down. We are manufacturing some spare parts. This work will be completed May 1. Our working force at present is about 25 per cent of normal capacity.

"We are hoping that the immediate future has more in store for the aircraft industry. Its present status is not conducive to the investment of capital and the morale of the skilled mechanics in the industry is broken because of instability of employment. We have built up two effective and efficient factory organizations in the past year only to see them broken up each time because of lack of work. If the underlying causes responsible for such conditions are not removed, the aircraft manufacturers cannot be depended upon to maintain even a shadow of an organization that would function effectively in the event of a national emergency."

* * * *

Visiting Washington at this time gives a very disheartening impression. Everyone seems to be living in the past, delving into records to fortify their position and preparing for investigation after investigation. The Daugherty Committee has been delving into aircraft in a way that has given the newspapers first page copy almost daily. And these are always labeled "Aircraft" scandals. It is only fair to point out that in practically every case the complaint is made against companies that either were or are automobile manufacturers. Also, the complaints seem to lie in the main against companies that came into the aeronautical field when war contracts were in sight. The Standard Aero Corporation case is an exception, but as this firm was financed by Japanese capital, and ceased operations after the War, that criticism can hardly be made against the present industry. Occasionally we are asked why we do not print more of these "scandals." The truth is that we neither have the space nor the inclination to do so. Denials follow scandalous charges so fast that even the daily papers cannot keep up with them, much less a weekly. Furthermore, these hearings are given such wide publicity in the daily press that it would be "cold" before it reached our readers.

* * * *

The Joint Committee of the House on Military and Naval Affairs has been keeping both the Army and Navy Air Services busy with its investigation of the duplication of functions, equipment and activities. As this has not been given much publicity, AVIATION has arranged to publish the high lights that have been brought out. For a week or so every important officer has been devoting most of his time to this important hearing.

* * * *

And then, of course, great preparations are being made for the hearings of the House Committee that is to investigate all the aircraft activities of the government. It is generally supposed that this committee will hear the complaints from dissatisfied inventors first, then go into the cross-licensing agreement, and finally take up the ever-present problem of a Separate Air Force. Everyone welcomes this investigation as it will, it is hoped, once and for all bring to the surface the claims, and the motives behind them, that have been beneath the current of aeronautical progress. But this state of things in Washington does not make for progress while it is prevailing. It is hoped that eventually good will come from it—something that will be constructive, and mainly a continuing national aviation policy.

* * * *

AVIATION has been having a little investigation of its own into the publishing activities of the Air Service. We are pleased to note that the Air Mail Service has severed all connection with the magazine *U. S. Air Services*. But more of this later—perhaps, so that our readers may learn how it is possible to publish such bulky aviation papers while AVIATION has to appear so modestly in size and editorial matter. It is an interesting story.

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The National Aeronautic Association

LAST year, when Howard Coffin, then president of The National Aeronautic Association, returned from a European visit he found a condition at headquarters in Washington that called for an immediate curtailing of expenditures. The latter were then running at the rate of $20,000 a month. AVIATION commented at that time very mildly on the bad situation of the N.A.A., knowing that it would be corrected as soon as Mr. Coffin could investigate. This was done, and the officers of the N.A.A. went to St. Louis with the best of resolutions to make sure such an elaborate program would not be entered into again. The members were assured of three things: first, that the budget as prepared by the treasurer, Colonel Castle, would be the limit of expenditures; second, that a general manager would be employed; and third, that a membership and constructive policy would be inaugurated.

Next week Frederick B. Patterson, new president of the N.A.A., returns from Europe and will find a condition which is exactly the opposite of that of last year. Visitors to headquarters note none of the activity expected from a national organization. The Contest Committee, though acting, we believe, beyond the scope of the F.A.I. authority, is functioning excellently under the able direction of Colonel Lahm. It is not, however, anywhere near the budget figures, as specifically fixed at St. Louis. In fact, the first action taken was to disregard the will of the convention in this respect. Mr. Patterson agreed to assume personally, in connection with the National Cash Register Company, the entire expense of the membership campaign, which has been so successfully handled by Admiral Fullam. Whether or not this generous offer conformed to the ideas of the members is unimportant, as it was perhaps the only way that a large membership could be obtained.

As far as the expected General Manager is concerned nothing has materialized. The National Cash Register Company "loaned" its Publicity Director to act as the personal representative of Mr. Patterson in Washington. This official suddenly resigned last month for reasons that have nothing to do with aviation.

As for a constructive or continuing policy, there has been none in evidence. Many letters have been received by AVIATION asking what the N.A.A. stands for. The only definite statement that could be given was the Winslow Bill, which seems to be undergoing silent treatment.

Again we urge that the officers and governors get back to the budget, that a general manager be secured and a national policy formulated. Last year's activity was too ambitious, this year it has entirely centered on the membership campaign. It is not too late to make the organization a real factor in American aviation and we sincerely hope that this will be done.

Our Timid Diamond Heroes

THE EVENING WORLD of New York recently printed an editorial, "Air Route Closed to Baseball Players," which is reproduced below. The reticence of ball players to give up their lucrative jobs during the war will be recalled. Now that they are forbidden to fly, we can only hope that their automobiles will be left to them.

The editorial in question reads as follows:

"The order of major league baseball managers forbidding their players to ride in airplanes is a new wrinkle in this age of prohibitions. If this taboo is on the score of the supposed danger of flying it will be puzzling to players whose managers fearlessly send them to the batter's box against the rifle ball pitching of such human catapults as Walter Johnson and 'Bullet Joe' Bush.

"Frequently published statistics proving the relative safety of flying seem not yet to be convincing to many people. Those who are experienced in cross-country flying prefer the suppositious hazards of the air to the dangers of the highway and the rail. Within recent memory baseball players have been killed by the pitched ball, in automobile wrecks and in train collisions.

"The number of aviators and passengers who lose their lives in airplanes is small in proportion to the number of persons flying and the number of miles flown. Monday morning automobile accident reports are much more horrifying. Aerial transport will not become as popular as it deserves to be in the country that gave birth to the Wright brothers until the too common notion of its danger is dispelled.

"Not many years hence baseball teams will travel from city to city by air, just as business men in Europe now use this time-saving and relatively safe means of transportation."

The 1924 Schneider Cup Race

THRIFT lovers of the sport of air racing will be delighted to hear that five foreign entries—three Italian and two British—have been secured for the forthcoming Schneider Cup race, which will be held Oct. 24-25, 1924, at Baltimore. These five entries together with the three ships which the Naval Bureau of Aeronautics has entered in the race are a happy augury for excellent sport.

American flying men have a particular reason for being interested in this race, as it will, for the first time in the history of air racing, witness foreign machines fitted with American engines compete with our own products. Curtiss D12 engines will be used on the Italian entries, and perhaps on one of the British entries too, now that the Fairey Company has acquired the British manufacturing rights of this engine.

Here we have but another indication of the important role American aircraft equipment is assuming in the world of international aeronautics.

Modern Aircraft Bombs and their Use

Prepared by Engineering Division, U. S. Army Air Service,
McCook Field, Dayton, Ohio

Success with aerial bombing does not always require 100 per cent direct hits but it does demand that average results be within limits of error which are well defined, according to the kind of objective and type of bomb suited to it. Successful bombing is a combination of good tactics, personal skill, instrumental precision, and operating advantage, which latter includes the ease of operating the bomb sight, communication, and general arrangement in the airplane design.

While tactics are prescribed by the nature of the objective, type of bomb, relative offensive and defensive conditions, foreseen or unforseen, their successful application depends to the highest degree upon team work. The method of operating the bomb sight may influence tactics, while team work itself depends upon intimate familiarity of both pilot and bomber with the use of that particular instrument, and is a matter of incessant practice.

Importance of Bomb Sights

Except for extremely low altitudes at which pursuit airplanes may effectively release small bombs, by means of skilled estimation alone, and for comparatively large or long targets, such as a battleship or a road, the highest skill is powerless to get results at even moderate altitudes without a sighting instrument. The occasional hit which was made with crude sights, or early in the war without any, was justly celebrated because it was phenomenal, but the impression that this method can compete with the sighting instrument and show a successful average, was most conclusively proven to be a fallacy. A consideration of errors will make it quite evident that even at moderate altitudes a sighting instrument is essential to correct for the wide variation of factors which causes errors beyond human ability to estimate or calculate under flight conditions.

The use of spotting shots for correcting range is far more difficult than from a fixed ground gun location, because the range is constantly changing and alignment also requires changing, on that the spotting correction is not accurate; too long an approach may be required in a straight line; and finally the opportunity for using spotting shots is generally rare.

The ultimate purpose of the bomb sight is to indicate the correct instant when the bomb must be released, there being but one instant possible for any given line of approach to an objective. The instrument should provide some method for receiving corrections for the variable factors, and to calculate for, or indicate, the range or sighting angle.

How a Bomb Drops

It is not uncommonly thought that a bomb, when released, falls vertically downward, and that the skill in bombing depends upon the pilots estimation of the vertical over the target.

The bomb must actually be dropped ahead of the target a distance depending upon the particular combination of conditions then existing for each line of approach, this range distance actually amounting to from 500 ft. to more than a mile. The one extreme is for very low speed airplanes at low altitudes, the other for high altitudes and high speeds.

The bomb, upon release, responds to the force of gravity, which is strictly vertical, and we may consider vertical component of its velocity and direction. The actual path or trajectory is not vertical, because it comprises also a horizontal component. When the bomb is released it has the same forward velocity as that of the airplane. Consequently the horizontal distance which the bomb will travel, while falling, is a factor of the airplane's ground speed at which it was released, and the time of fall which depends upon the altitude.

The bomb will not, it is true, continue travel forward at the airplane speed, because of retardation of air resistance, but inasmuch as it does not lose all of its initial forward impulse, even through a 10,000 ft. drop, it will be seen that its horizontal speed carries it, during its fall, far ahead of vertical under this position at release.

The case may be stated in another way, that, due to air resistance upon the bomb, it will not, during its fall, quite keep up the same horizontal velocity as that of the airplane, but will lag behind, and strike the ground considerably to the rear of vertical under the airplane.

All trajectory calculations are made with reference to the vertical, but inasmuch as the airplane does not constitute a stable base, this introduces a fifth factor, bringing into consideration the stabilization of the sighting instrument. Such oscillations of the airplane have been found to be of the order of one to two degrees pitching and rolling. These oscillations are due to restoring forces of the inherent stability of the airplane, and can not be detected by the pilot nor corrected by him. Without stabilization of the sighting instrument, they introduce errors of the order of 100 to 200 ft. in range and line.

Dropping Angle

Dropping angle, variously called "range angle" and "sighting angle" is the angle ahead of vertical, at which the line of sight must be set so as to intersect the objective at the correct moment of release. This straight line of sight must intersect the ground where the bomb's actual curved trajectory, corrected for all variables, will also intersect the ground.

The dropping angle may vary for different combinations of all variable factors anywhere from 50 deg, for high speeds and low altitudes, to 5 deg, for low ground speed and high altitudes, and it may even be a negative angle.

It is obvious that provision for a view of the ground by the bomber, through the fuselage to cover the sighting angles, is very important in airplane design, in fact, the armament section recommends in the Handbook for Designers, that provision should be made for sighting the objective still farther ahead, over twice the actual range distance, to enable the bomber to readily pick up the objective.

The horizontal distance on the ground of the intersection of the bomb's path ahead of a point which is vertically below the airplane at the instant of release is known as the range. The bomb must be released at the range distance away from the objective.

Range may vary for the above-mentioned extremes anywhere from roughly, 500 ft. to 7000 ft., or even a negative distance of a couple of thousand feet for an extreme case, in which the ground speed is about one-fifth of the air speed and at high altitudes.

Historical Development

From what has been said about the nature of the trajectory, it will be seen that if a point on the ground can be determined where the bomb's path will intersect after releasing at any instant, the line of sight could be set comprising merely two nails. This in fact was the earliest form of bomb sight, along with the use of a line painted on the outside of the fuselage. Such a fixed angle of sight is correct, however, only for one altitude, ground speed and type of bomb combination, and while the conditions of early bombing permitted about the same combination, such a fixed angle did provide a rough estimation for the bomber. As bombing was forced to higher altitudes, however, and new types of airplanes varied in speed, some adjustment had to be provided for the variable factors, and the nails were than spaced vertically according to altitude, and horizontally according to ground speed. The great difference in range between bombs of different types received little attention until studies of their trajectories revealed the necessity for adjustment of this factor.

It was customary to approach only up or down wind, and even late in the war few sights in service had any provision for alignment in a cross wind, or for finding the true ground speed along such a drift course. One of the most needed improvements was for a method of determining more accurately the actual ground speed at the time of bombing.

The general differences between one bomb sight and another are

(*a*) In methods of stabilizing the vertical line to which the sighting angle is referred.

(*b*) In provisions for approach when in line with the wind or for alignment offwind.

(*c*) In methods of determining actual ground speed.

One of the most accurate methods for determining ground speed is to time by watch the passage of the airplane over a known ground distance, when the ground speed is then that distance divided by the time. A sighting angle can be set according to altitude so as to subtend such a known distance upon the ground. With this system, calculation of the ground speed is still necessary, together with the resetting of the angle.

In the C.F.S. timing scale came an improvement in which the necessity for calculation was eliminated. With this device a horizontal scale of altitude is retained but a time graduation was added, to which the fore sight is reset according to the number of seconds occupied in passing over the first setting. The resetting of the fore sight then gives the correct dropping angle. The first setting is to an altitude scale which is so calibrated that any ground objective is timed back to the vertical over a distance arbitrarily chosen as 100 times the falling time of the bomb from that altitude.

Photo U. S. Army Air Service

Various types of aircraft bombs experimented with at Aberdeen Proving Grounds

Successful Bomb Sights

One of the most successful bomb sights used during the war was the Michelin and an American modification of the Michelin which was made by the A.E.F., called the 7th A.I.C. The success with this bomb sight was due to the accuracy of the stop-watch method of measuring ground speed, and also the fact that the sight was stabilized as a pendulum with air dash pot damping. The objection to the stop-watch method of timing, which is liable to considerable personal error in use has since been eliminated in a synchronous type of sight developed by the armament section. The Michelin sight had no correction for different types of bombs and this also has been provided in newer sights.

Another very ingenious principle was applied to the French St. Aé sight comprising a very accurate method of timing ground speed, requiring no calculation but necessitating the use of a special reversable stop watch.

Stop-watch methods have since been improved and applied so as to eliminate manual operation, and to remove the objection to flying in a straight line for any serious length of time during approach, but the difficulty of obtaining such watches in this country during the war led to the adoption of the English Wimpern method of obtaining ground speed by the simple process of setting the air speed and adding to it or subtracting from it, the wind. This sight is our present standard until newer forms are in production. The altitude scales on the English sight were found to be incorrect and these were revised and extended. In this sight the bottom fore sight is spaced vertically below the top rear sight according to an altitude scale, while the horizontal spacing of the fore sight ahead of the rear sight is accomplished by moving the rear sight back and forth.

The feature of this sight is the method by which wind speed may be determined, involving flying 90 deg. across wind, setting a drift bar upon the resultant ground course, and thereby automatically determining the wind velocity.

While the standard sight is not stabilized, but is intended to be fixed on the outside of the fuselage, the armament section has designed and tested a stabilizer and pilot director adapted to this sight, so that the instrumental accuracy is increased, and also it becomes possible to use this sight in an offwind approach.

The "Negative Lens"

A so called "negative lens" was used as a bomb sight by the British in an attempt to enable the pilot to observe the objective and release the bombs. This lens fixed in the floor, brings into view a ground area somewhat larger than can be seen through the same size free opening, but with some reduction in size of the image. The lens is crossed by three transverse lines, one of which is used in combination with a single cross wire on the bottom of the fuselage, so as to constitute the sighting angle for one of three combinations of altitude and ground speed. The bottom wire was made adjustable to a scale by which the wind speed could be added to or subtracted from the nominal air speed, but inasmuch as this must be set on the ground before flight and can not be adjusted in flight, the ground speed setting, therefore, has all the inaccuracies of a weather prediction. This sight is not only very limited in vision, but it has been found by repeated attempts, that it is impractical for a pilot to make the close observations which are necessary in the use of a bomb sight, because it requires all of a pilot's attention to maintain constant speed, levels, and alignment, while the bomber's attention must be riveted to the sighting process. Such a lens, however, does have a useful application for camera work as a finder.

The American Mark III, or Navy type of bomb sight, operates upon practically the same principle as the Mark I, with the addition of a drift feature by which the wind direction once determined, may be thereafter set into the sight by compass while the line of sight is also carried on the drift bar and thus approach may be conducted off-wind. This sight also constitutes a standard, available in small quantities until improved forms of sight are in production. This sight has recently been remounted with pendulum stabilization and an improved form of pilot director, by the armament section, giving it much greater instrumental accuracy.

Errors in Bombing

The personal element enters to such an extent into the use of bomb sights, that the best instruments will give most unsatisfactory results without constant practice in team work.

Without means for accurately guiding the pilot in the ap-

proach, it is quite usual that the pilot may estimate the line by 10 deg off. If the ground course is but 5 deg off the target at instant of release, the lateral or line error will be the tangent of 5 deg times the range, and assuming an altitude of 6000 ft. and a ground speed of 100 ft. per second, the target will be missed by about 170 ft. Poor alignment is one of the chief sources of error in bombing

Another chief source of error in most bomb sights, is due to an inaccurate ground speed determination. At the altitude and ground speed above assumed, if the ground speed is set into the sighting angle 5 m.p.h. wrong, the error in range will be about 145 ft.

With bomb sights in which the air speed indication is used to obtain ground speed, by adding or subtracting the wind, any error in air speed indication then makes just that much error as a ground speed factor, but with sights in which ground speed is directly determined as in timing methods, then any error in air speed indication is comparatively small, since it effects only the ground lag portion of the total range distance.

Altimeter Errors

Again, supposing an altimeter reading of 6000 ft. is actually 400 ft. low, then for the altitude and ground speed above assumed the bomb will hit about 70 ft. short of the target While the errors in altimeter indications may in some instruments be even 10 per cent wrong, the average error in altimeter indication is not so serious in bombing as many other errors.

Considering bombs which differ in terminal velocity between 600 ft. per second and 1000 ft. per second, then if there is no adjustment in the bomb sight for this difference, but the trail angle is fixed for an average of say 600 ft per second, then, with an air speed of 100 m.p.h., at 2000 ft altitude, a bomb of 600 ft. per second terminal velocity, would fall about 55 ft. short, or at 20,000 ft. altitude would fall about 1000 ft. short, while a bomb of 1000 ft. per second terminal velocity would fall about 25 ft over at 2000 ft altitude, and about 400 ft. over at 20,000 ft. altitude. It will be noted that the difference in range becomes much greater for bombs of low terminal velocity, except at very low altitudes where the error is comparatively small.

If a bomb sight is not stabilized in the line of sight, set for a definite range, the angle ahead of the vertical will be thrown off through whatever angle of oscillation the airplane may be in, at the instant of release. Assuming an altitude of 6000 ft at a ground speed of 100 ft. per second, then if the fuselage pitches 2 deg at the moment of intersection of the line of sight with the objective, the bomb will hit about 130 ft short.

The facts that the bomb is released at 2 deg. pitch instead of horizontally, or that there is a resultant error in ground speed due to that pitch, are not of much consequence in comparison with the big error of sighting 2 deg off This makes very evident the need of stabilizing the sight.

Influence of Bank on Bomb

A lateral banking of the airplane of the same degree will not affect the range, but if held in that bank, may result in the bomber's alignment of the course by a line offset error. The fact that airplane is banking at the instant of release will not introduce any appreciable error in launching the bomb for an small an angle, but sidewise slipping of the airplane, due to holding a small bank, will introduce only a negligible lateral velocity of the bomb The fact that an unstabilized sight tilts, however, with the airplane, handicaps the following of the longitudinal direction line in a vertical plane and therefore makes lateral stabilizers highly desirable

A new sight, known as type D1, has been designed and constructed under the supervision of the armament section, Engineering Division, Air Service, which operates upon the synchronous principle; is provided with stabilization; and an improved form of pilot director, which promises to be a great improvement over anything we now have or had during the war This sight uses a very accurate and simple method of obtaining ground speed, while the timing process requiring straight flight, has been reduced to a maximum under the worst conditions of about 22 sec. This is less than half the time required by the Michelin sight. The sight is also very accurate instrumentally, as correction has been provided for different types of bombs, and an offset correction provided for the effect of wind in an offwind course. Timing may be done either on the objective itself or any other ground object at the bomber's option.

While we have been obtaining excellent results with pendulum stabilizers, we are continuing the research work started by the Ordnance Department on various forms of gyroscope

Courtesy U. S. Naval Institute

Explosion of an aircraft bomb dropped by a naval flying boat

stabilizers, and have had built a completely new system, which is instrumentally rather complicated but by which we expect extreme simplicity of operation.

Bomb Carrying and Releasing Devices

In order to drop bombs from airplanes or airships with any degree of accuracy and effectiveness, it is necessary to carry the bombs in a device that will hold the bombs in such a position that when dropped they will be pointed in exactly the direction that they are traveling at the instant of release. This position is horizontal or parallel with the line of flight.

The device to hold the bombs is now known as a "bomb rack." The handle which causes the rack to function is not built as a part of the bomb rack, as it must be in a convenient position for the bomber This handle, or lever, used to transmit the force to operate the release mechanism of the rack, is known as a "bomb release handle."

The bombs are divided into two general classes, depending upon the type of casing used for different purposes. They are known as fragmentation or demolition bombs. The fragmentation bombs now in use are the Mark II, III and IV, weighing in the case of the Mark II, about 17 lb.; the other two weigh 25 lb.

The present demolition bombs are known as the 100 lb., Mark I, the 300 lb Mark I, the 600 lb. Mark I and the 1100 lb Mark II. These bombs are streamlined with no cylindrical surfaces and are supported by two lugs spaced 14 in. apart. The lugs are placed, one on either side of the center of gravity of the bomb Since the same distance separates the two lugs, the bombs are more or less interchangeable on the different bomb racks. The degree of interchangeability depends upon the size and capacity of the bomb rack only.

Special and extra large demolition bombs have also been designed and used and racks built to accommodate them. The 1100 lb armor-piercing bomb is made up of a 12 in. projectile. It is largely cylindrical in shape. This bomb also has lugs spaced 14 in apart and can be carried by the same racks as the standard streamlined 1100 lb. bomb. This bomb was designed for use against battleships and steel fortifications.

Heavy Demolition Bombs

A 2000 lb demolition bomb, cylindrical type, is now a standard bomb and was used in sinking the German battleship Ostfriesland It is carried either by means of bands which may be released with the bombs or by means of lugs spaced 30 in. apart, which is the standard spacing for the large cylindrical bombs.

An experimental 4000 lb. demolition bomb has also been developed but has not been adopted for standard use. It is cylindrical and similar in design to the 1100 lb. armor-piercing and the 2000 lb demolition bomb It is provided with two lugs for carrying purposes, which are spaced 20 in. apart.

The fragmentation bombs are carried by means of the type A2 bomb rack This rack is a modified Mark XVIII bomb rack which is designed to carry five fragmentation bombs, or two 100 lb. demolition bombs. It is also equally adapted for carry three 50 lb. demolition bombs. These bombs are now obsolete as demolition bombs, but the cases are used for carrying incendiary material, used for making smoke bombs, and for gas bombs. This rack is known as an "External type bomb rack," because it is carried outside the fuselage of an airplane or outside the car for a balloon.

The A2 rack is used on all pursuit airplanes, two-seaters, and as auxiliary equipment on other airplanes.

The 300 lb. Bomb Rack

The 300 lb demolition bombs are carried by means of the type B1 bomb rack, which was formerly known as the Mark XVI bomb rack. The type B1 rack is being equipped with metallic support beams. This rack carries either two 100 lb demolition bombs or two 300 lb. demolition bombs or one of each size. They are supported and released by means of a shackle, with hooks spaced 14 in. apart. When carrying bombs the shackles stand out at an angle of about 45 deg This is caused by the bombs bearing against a pair of bomb-retainer brackets which prevent the bombs from swaying The axis of the bombs point in the direction in which the airplane is flying

The rack is an external type rack and may be attached either to the under side of the fuselage or lower wings of an airplane or to the under side of the car of a dirigible. Two release cables release the two bombs separately. Another pair of cables operate the safety mechanism. The cables are housed usually in a No 13 Bowdenite casing which is a flexible control that may be easily installed.

Safety Device

The safety device consists of three steel balls in a metallic housing which are held in contact by a spring of 3 lb. resistance. This permits the standard safety wire to be pulled out, as in the case of the safety device on the type A2 bomb rack when the bombs are to be dropped "safe." When the bombs are to be dropped in the "armed" condition, a cam shaft of the safety device is revolved through an angle of about 90 deg, which forces the steel balls against a fixed stop This effectively prevents the safety wire from pulling out of the safety device, so the wire is pulled from the fuses of the bombs instead and the bomb dropped "armed."

The rack is generally attached to the airplane by mean of T rails spaced 18 in apart, which is standard spacing for all external bomb racks except those for the 2000 and 4000 lb. bombs. A factor of 7 is used in making bomb rack installations.

When it is desired to carry 600 lb. or 1100 lb. demolition bombs, tha type C1 bomb rack is used. This rack, when designed was known as the Mark XIX bomb rack. It is an external type rack but carries only one bomb at a time. The bomb is also carried horizontally and installed so that its axis is parallel to the line of flight of the airplane or dirigible. This rack carries either one 1100 lb. demolition bomb or one 1100 lb. armor piercing bomb or one 600 lb. demolition bomb. The bomb is suspended and released by means of a shackle similar in size to that used on the type B1 bomb rack, except that it is stronger to carry the heavier bomb

Anti-Battleship Bombs

The 2000 lb. and 4000 lb. bombs are carried by a bomb rack called the type H2. This rack is somewhat similar to the type C1, except the shackle is much heavier and a safety mechanism is incorporated in the release. A movement of the release handle forward releases a bomb "armed" while a similar movement to the rear causes the bomb to drop "safe." The carrying hooks on this shackle are spaced 30 in. apart. This rack is also carried outside of the fuselage of an airplane or may be carried outside the car of a dirigible balloon. It should be installed with a factor of seven.

Another general type of bomb rack is the internal type. This type of rack is built into the fuselage of an airplane or car so that the bombs do not cause any head resistance. Internal bomb racks were used in the Handley Page, Caproni, and are now in use in the Martin MB2 airplanes. The rack now in use in the present Martin airplanes is the type G1 or Mark XX rack and carries twenty 100 lb. bombs, or six 300 lb. bombs

The Martin bombers which are now under construction, will be equipped with the type G4 bomb rack. This bomb rack is similar in design and capacity to the type G1 or Mark XX bomb rack except that the safety device is incorporated in the bomb shackles. Therefore, the safety wire for each bomb is attached to the shackle which carries that bomb A special safety-control mechanism is built as part of the rack to operate the safety lever on each bomb shackle. By this means all of the shackles are placed in either the "armed" or "safe" condition. Any number of bombs can be released in either the "safe" or "armed" condition by changing the position of the safety levers at the will of the operator at any time.

Dynamic Stability as Affected by the Longitudinal Moment of Inertia

By Edwin B Wilson

In a technical note (No 115, October, 1922) issued by the National Advisory Committee for Aeronautics, Messrs. Norton and Carroll have reported experiments showing that a relatively large (15 per cent) increase in longitudinal moment of inertia made no noticeable difference in the stability of a standard S E. 5A airplane. They point out that G. P. Thomson in "Applied Aeronautics," p. 208, stated that an increase in longitudinal moment of inertia would decrease the stability. Neither he nor they make any theoretical forecast of the amount of decrease. Although it is difficult, on account of the complications of the theory of stability of the airplane, to make any accurate forecast, it may be worth while to attempt a discussion of the matter theoretically with reference to finding a rough quantitative estimate.

A copy of Report No. 172 may be obtained upon request from the National Advisory Committee for Aeronautics, Washington, D. C.

Britain and Air Transport

The important role civil air transport is assuming in British economic life is shown by that the *Export World and Commercial Intelligence*, a monthly journal devoted to the expansion of British trade abroad, now prints in each issue an aeronautical supplement.

In this supplement civil air transport is discussed from the viewpoint of economics. The measures the government is taking to increase the Royal Air Force is also receiving attention

Blazing the Air Mail Path in Alaska

Report to the Second Assistant Postmaster General on the First Trip of the Alaskan Air Mail Service

By PILOT C B EIELSON

The Air Mail Service recently instituted an experimental air mail route between Fairbanks and McGrath, Alaska, an air line distance of 280 miles, for the purpose of accelerating mail delivery By dog team—the only conveyance which can be used in the winter months—the length of the route is 371 miles, and it takes on the average eighteen days to cover this distance.

On the Nenana-Iditarod route the dog teams for years have made weekly trips, a team leaving each terminus every seven days, carrying 800 lb of mail each way with 100 lb. additional in food, equipment, and feed for the hungry huskies The pay is $1,022 a round trip, which consumes about thirty-five days

The first Air Mail test flight was made Feb. 21, 1924, by Pilot C B Eielsan with 160 lb of mail Leaving Fairbanks at 9 00 a m the plane arrived at McGrath 11 50 the same morning and began the return trip at 2 45 p m Due to a forced landing it did not reach Fairbanks until 6 40 p m

The second trip was made on March 1 with the temperature at 8 deg below zero The flying time, with 250 lb of mail, was 3 hr. 15 mn. to McGrath and the return to Fairbanks was made, with 150 lb , in 4 hr. 19 mn A considerable contrast to the eighteen days each way required for the dog sledge!

On the third trip the flying time to McGrath was cut to 2 hr 55 mn and on the return trip to 3 hr. 40 min

So interesting was the report of Eielsen's adventure that the Postmaster General read it at a recent Cabinet meeting and President Coolidge, impressed by the tale, wrote a personal letter to the Air Mail pilot congratulating him upon the successful completion of his flight. Accompanying this letter went one from Mr. New of similar purport

"I congratulate you on the conspicuous success of your undertaking," the President wrote "Your experience provides a unique and interesting chapter in the rapidly developing science of aerial navigation"

A thrilling narrative of these experimental flights is contained in a report by Pilot Eielsen to Col Paul Henderson, Second Assistant Postmaster General, in charge of Air Mail Service, which is repraduced below.—EDITOR.

Owing to delay in the construction of our hangar, caused by extreme cold weather, we were unable to move the De Haviland into the building until Feb 16 On Feb 20, we completed setting up the machine The next morning I started on my first trip

Our landing field, which is 1200 ft long and 600 ft. wide and surrounded by low scrubby trees, was covered with from two to three feet of snow The snow up here is of a very light, dry, powdery variety It does not pack well, as is the case in the States, because there is so little moisture in it. The skids on the airplane dug about a foot and a half into the snow, thus making it impossible to taxi except by using about 1300 r p m I find that the wide skids are more practical for this country

The thermometer registered 5 deg below zero at the start of the first trip There was no wind The sky was about two-thirds overcast with clouds, which lay at an elevation of 4500 ft.

Equipment for Arctic Flying

I carried 164 lb of mail, a full set of tools, a mountain sheep sleeping bag, ten days provisions, 5 gal. oil (Mobile B), snow shoes, a gun, an axe, and some repairs. My clothing consisted of two pairs heavy woolen hose, a pair of caribou socks, a pair of moccasins reaching over the knees, one suit heavy underwear, a pair of khaki breeches, a pair of heavy trousers of Hudson Bay duffle over that, a heavy shirt, a sweater, a marten skin cap, goggles, and over that a loose reindeer skin parka, which had a hood on it with wolverine skin around it Wolverine skin is fine around the face because it does not frost. On my hands I wore a pair of light woolen gloves and a heavy fur mit over that. I found I had too much clothing on even when I had the exhaust heater turned off At five below zero I was too warm I could fly in forty below weather in perfect comfort with this outfit and the engine heater On my second trip I cut out the caribou socks, the duffle trousers, and the heavy fur mittens and was entirely comfortable

May I not suggest to the Department that all mail pilots be supplied with reindeer skin parkas and large size moccasins. I have worn the fur jumpers that are in use outside and it is my opinion that they are not to be compared with the parkas. This is the consensus of opinion among the old timers here, who have tried everything to ward off the cold The parkas are knee length, they are very light, they pull over the neck so no wind can blow in through the flaps.

The following are the advantages of the parkas (1.) Cost only forty dollars for a good one (2) Light and roomy Do not bind (3) Have a hood on them which can be pulled over the head and tied so that only the eyes are exposed The fur around the hood is wolverine so it does not frost. (4.) Can jump in and out of plane as well with one on as if you did not have it on. (5.) In case of forced landing, pilot could walk as well with it on as off It is impossible to wear the jumper as it is too heavy for walking. (6) Greatest warmth for its weight.

The First Flight

The moccasins are advantageous because they are light, warm and comfortable As many pairs of stockings as necessary can be put on The rudder can be felt all the time, thus giving better control

I took off the field on Feb 21 at 8 45 a. m. The skids dug into the snow until I got up a little speed, then gradually

U. S mail plane at Fairbanks, Alaska, after first landing there in darkness on return flight from McGrath, Feb. 21, 1924

The Air Mail in Alaska—Mail DH, fitted with skis, on the frozen surface of the Tanana river, Nenana, Alaska, March 12, 1924, during a flight from Fairbanks to McGrath

raised out. I ran 800 ft. before I left the snow. I turned the motor to 1450 r p m until off the ground. I then cut it to 1300 I turned the motor from 1250 to 1350 on the trip. The motor never missed coming or going. The tachometer did not work steadily, but the engine was perfect My air speed indicator did not work at all and my compass was off about 40 deg in some direction on account of magnetism in the engine, Both of these I have since corrected As I am well acquainted with the country over which I am flying, I did not depend on my compass except to follow relative readings taken by pointing the plane at landmarks which I knew.

Following the Frozen River

After testing the motor and balance, I hit my course The first 50 mi I followed the Tanana River, which is a fair emergency field though the ice is a little rough in places. At Nenana, a town of about one hundred inhabitants, I left Tanana and steered across the country. I veered to the left on a straight course in order to follow the flat country and stay near the road houses, which are located on the mail trail at intervals of about 35 mi. After about an hour and a half I spotted Lake Minchumina to my right I was then half way between the lake and Mt. McKinley, each of them probably 30 mi away I passed to the left of the Minsath Mountains and a little later saw the main Kuskokwim River, which I followed in to McGrath, my destination. I landed in the Takotna River at McGrath at 11 35 It took me 2 hr 50 min to cover the 260 mi, straight course, and I had a slight favorable breeze The way I had come I had covered about 315 mi. There was about a foot of snow on the River, an excellent landing field. I came down smoothly, sliding about 500 ft after the skids first touched the snow As I had plenty of room, I intentionally made a fast landing

The mail was transferred to a dog team, the gas tank was filled with the same kind of gasoline (Domestic Aviation Gasoline—about 62 deg B test), 3 gal of Mobile B was added to what was left in the tank. (I cannot change oil over there as there is no Mobile B there) The thrust bearing was filled with oil, clearances checked and engine inspected. Then had lunch, loaded on 60 lb of mail (which was all they had) and started the motor I had no experienced help what so ever as no one over here had ever seen a plane It was difficult to start the Liberty all alone I got a man to hold my hand while I swung the propeller; an oar being in the cockpit. It will be easier from now on as I am instructing a helper at McGrath

The Return Trip

I left McGrath at 2 35 p m.—that was the earliest I could get ready on first trip. I knew this was pretty late as darkness descends early here in February. I did not want to stay over as the day was good and I thought it might be very difficult to start the motor after it stood out all night in the cold and it would be hard on the motor. As there was no wind I thought I could get back in better time by flying a little faster and taking a straighter course. I expected to get home by 5 40 p m—that is just at dusk.

I flew over Appel Mountain and 1 hr 15 min. later I reached Lake Minchumina, which is nearly the half way point Later I passed over a stream which was not on my map, and I thought it must be the Kantishna River. Later I reached the Kantishna River and I thought it was the Tanana River as it was time for me to be nearing Nenana To the left I saw a bluff that looked like the Nenana bluff; I checked it further by noticing a river going around the bluff, but I was positive that it was Nenana when I saw a river entering the Tanana at the point where the Nenana River enters the Tanana at the town of Nenana. I struck for the bluff, and everything was all right excepting that the town of Nenana was not in its place I knew I must have veered to the left so I started up the Tanana to find Nenana. I followed it for half an hour (that is 50 mi) By this time it was pitch dark. I could not believe that I had got 50 mi. off my course after the same compass course had brought me to Lake Minchumina half way and this was exactly on the course. I could not see the lights of Nenana so I left the river, going East. I thought I must have got on the Kantishna River and that I was following it back to Mt McKinley as the country looked flat in the pitch darkness. The sky was entirely overcast—not a star showed.

Lost in the Darkness

I wandered about completely lost for most an hour then I knew that the river I had left was the Tanana. About this time I saw a light so I cut my altitude and went down to it It must have been a trapper's cabin near the Chatanika River. I was tempted to set the ship down there and have a nice place to sleep, but I knew I would wreck the ship if I did, so I decided to look around some more. I went back to the big river I had left and when I was following it down I saw a flare in the distance I hit for it and it turned out to be my home field There was a light in front of the hangar. I guessed at the extremity of the field and went in. I hit a tree in gliding and broke off one ski. In landing I nosed over and broke my propeller The trouble was all fixed up in three days and the plane ready to go again

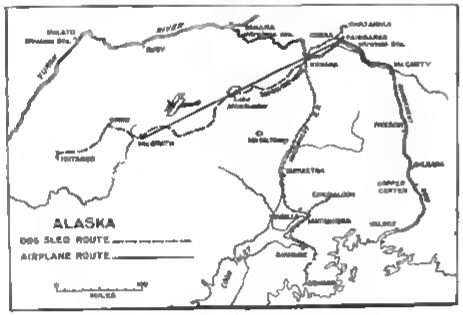
The entire town had been waiting at the field for over an hour I had been in the air 4 hr 10 min on the return trip I landed at 6 45 p m. I had been in the air 7 hr that day, covering a distance farther than from Fairbanks to Siberia, Fairbanks to Point Barrow, or Fairbanks to Juneau. This seems incredible in Alaska, for it takes a month of hardship at this time of the year to go from here to Nome by the fastest route—dog team

The second trip was made March 1. Weather report from McGrath in morning said "Temperature nine below zero, calm, clouds to South." At Fairbanks the temperature was zero Time of outward trip, 3 hr. 15 min Time return trip of 4 hr. 20 min. Poor time on return, due to head wind

Left here at 8 15 a. m and carried 252 lb. of mail, arrived

McGrath 11.30 Left McGrath 12 55 p. m. and carried 154 lb of mail, arrived here 5 15

Everything worked fine. Flew straight course going over Veered to left on return to follow flat country This is the most practical course in case of forced landing The mail trail cannot be seen for any distance I saw it only at a few



Sketch map showing the experimental air mail route and the dog sled route from Fairbanks to McGrath, Alaska

points. The danger of losing the course is small and in case of forced landing I am always within striking distance of a road house There are quite a few lakes and rivers for emergency landing The ground is covered with small scrubby trees On one side is the highest mountain range in North America and on the other a low range I use 20 gal of gas per hour at ordinary speed and about 1¼ gal. oil

The skis are excellent for landing, smoother than wheels, but easier to break The engine exhaust heater keeps the cockpit entirely warm

We are indebted to the U S Signal Corps for excellent weather service and reports on progress of flights, furnished by radio Have received finest cooperation from Capt. C Burkhead, U S A., and Warrant Officer Davis, both of Fairbanks.

American World Flight

The American World Flight squadron of four planes, under Maj. Frederick L. Martin, A S., covered on April 6 the first leg of its flight around the world by flying from Sandpoint Aviation Field, Seattle, to Prince Rupert, B. C., a distance of 650 mi. A telegram received by the Chief of Air Service from Major Martin states that his flag plane, together with Planes Two (Lieut. Lowell H Smith) and Plane Four (Lieut. Erik Nelson) left Seattle at 8 50 a. m. P. T. and landed at Prince Rupert at 5 p. m. P. T. Immediately after leaving Vancouver fog was encountered, which continued for two hours, with only 160 ft. of space between the water and the bottom of the fog For the next two hours the flight was through rain, then through snow squalls.

Plane Three (Lieut. Leigh Wade) had some trouble in taking off with the full load, and only rose from the water after the pilot had lightened the ship by removing some gasoline and baggage He followed the first three planes 1 hr 10 min later, arriving at Prince Rupert at 5 25 p. m.

The first three planes arrived at Prince Rupert in a blinding snowstorm, and in making a landing in Seal Cove, near some buoys, Major Martin underestimated the distance and was forced to make a sudden landing to prevent hitting some buildings on shore The only damage consisted in the breaking of two struts and four vertical brace wires on the left wing. None of the fittings of the airplane or engine were displaced As a result new struts are being made at Prince Rupert, and the crews of all four planes are remaining there to install the struts and rigging The locomotive shops and shipbuilding plant at Prince Rupert offered their facilities in making the repairs.

Prior to their departure from Seattle, the four World Cruisers were christened with the names of cities representing the East, the North, the South and the West, as follows: Seattle (No. 1), Major Martin; Chicago (No 2), Lieutenant Smith; Boston (No. 3), Lieutenant Wade; New Orleans (No 4), Lieutenant Nelson.

Several delays made it impossible for the squadron to reach Prince Rupert on April 1, as originally scheduled. First a pontoon on the Chicago sprang a leak, and when it had been repaired adverse weather reports delayed the start set for April 4. On the following day, while the flag plane Seattle was taxiing on Lake Washington to lead the squadron aloft, the metal shrathung of its propeller worked loose and the start was once more delayed To make matters worse, while the propeller was being removed, a monkey wrench dropped on one of the pontoons, puncturing it, which necessitated fitting a new one This required all-night work under the glare of searchlights.

The next stopping points of the American World Flight are Sitka (300 mi.), Cordova (475 mi.), Seward (135 mi.), Chignik (450 mi.) and Dutch Harbor (780 mi.).

The following telegrams from the President of the United States, the Secretary of War, and the Chief of Air Service, were received by the American Round-the-World Flight, at Sand Point Airdrome, Seattle, Wash.:

"More than four hundred years ago men first circumnavigated the world Two years were required in which many hardships were endured and extreme vicissitudes of fortune encountered Now men travel around the earth by land and water in twenty-eight days You are going to demonstrate the practicability of making such a voyage by air Before another four hundred years this may be the safest and most comfortable way Your countrymen will watch your progress with hope and record your success with pride

(Sgd.) CALVIN COOLIDGE"

"The Army first explored west across our continent to the Pacific Its soldiers found and guarded the trails for the covered wagons, the roads for the pony express and the routes for the railroads. The age of air travel finds the Army still the pioneer for transportation Airways have been traced and marked Your brother officers made the first non-stop transcontinental flight. You leave our shores on the "round-the-world" flight from near the point where Lewis and Clark first saw the Pacific Ocean May your expedition be of as much benefit to future generations. I wish you luck and success. We will watch your daily achievements with interest and pride.

(Sgd.) JOHN W WEEKS"

"You are about to embark upon the most important aerial undertaking yet attempted The whole Air Service has the greatest confidence in the personnel chosen for this mission and is sure it will be brought to a glorious conclusion. Here are the heartiest good wishes to each and every one. We shall watch your progress with interest and be ready to welcome you when you return

(Sgd.) PATRICK"

British World Fliers in Greece

The British World Flight commanded by Maj. A Stuart Maclaren made slow progress during the past week. Leaving Rome, Italy, on March 31, en route for Athens, Greece, and Cairo, Egypt, Maclaren's plane was compelled to descend on Lake St. Matthews, Island of Corfu, before reaching Athens, on account of some trouble not specified in newspaper dispatches. It appears that on landing considerable damage was sustained by the plane, and Major Maclaren had to wire to London for a new engine, as apparently only two spare engines were provided for the flight, and these were at Tokyo, Japan, and Vancouver, British Columbia This accident will delay the British world flight about three weeks, according to Col. Stephen Lowe, director of the American Near East Relief in Corfu, who is host to the stranded fliers.

Barnstorming and Making Money

By A GYPSY FLIER

The history of Barnstorming or Gypsy Flying is yet to be written That it is a subject of intense interest no one who has even superficially come into contact with it will deny. Some of the deeds performed by gypsy fliers are worthy of the pen of a Kipling, but they have so far gone unsung.

The article which is printed below was written by a typical gypsy flier. It gives an excellent picture of the conditions under which these pilots operate His views regarding the genuine services the responsible sort of barnstorming pilot—there are others, too—renders to the aircraft industry by laying the foundations of real commercial aviation are highly interesting and may prove a revelation to those who can see no good in the activities of the "unattached" fliers.

In this connection it is perhaps well to restate our own attitude on barnstorming While we do favor federal air legislation, provided it will regulate rather than suppress private initiative, we have always felt that the gypsy flier, in these days where commercial air transport is just beginning to fly by itself, is doing much more good than harm. As we wrote in our St. Louis Race Issue: "Like the Vikings of old, the gypsy fliers are, with all their faults, the true pioneers of civil flying Others may preach commercial aviation, but they—the gypsy fliers—practice it, supplementing with their skill the doubtful merit of the plane they fly They are thus laying the foundation of America's future greatness as a merchant air power—for they form, this very day, a reservoir of men probably unexcelled for flying skill and resourcefulness" Nothing need be added to these words.—EDITOR.

I was a war pilot, left the Army with 600 hr. flying time, and after some experience in the Air Mail I went into commercial flying I have been barnstorming ever since As a rule I have had good luck, have made a comfortable living and have toured the country several times

Right after the war we used to get $10 and $15 for a ride and many pilots refer to them as the "good old days." However, I have stumbled unto a system of barnstorming that has made me a lot of money I know it is contrary to the general run of thought, but I have got results from it and submit it for what it is worth

Dwindling Profits

A few years ago I flew into a small Pennsylvania town, of 2000 population, and carried six passengers at $10 each Next year I touched it at $5 and got five passengers. The following year I was flying over and stopped I put the price down to $3.50 and got five or six passengers A few weeks later I was once more flying that way and landed. I was "broke"—because of my foolishness, not because of fault of the game—and needed three or four dollars for a hotel bill that night It was almost dark and I hed to do something quick.

No one would ride at $3.60 (there were only a half dozen there anyway) so I, in desperation, put the price down to $1 per ride, and I made the price of my hotel bill

The next morning when I went out to the plane, at 8 a. m., there were fifty people waiting to ride at $1 and I needed some spare cash so started in

Trying a New System

My Jennie was turning up and the field was large enough to enable me to carry two passengers at a time I gave them a three or four minute ride of say 400 ft. for $1, and was careful to point out each time before they got in just how they were to signal to me, in case they wanted a $2 ride or a $3 or $5 trip, as a result of which a large portion signaled to lengthen the ride. I also made those that wanted a $2 ride go before the $1 passengers, and a $3 ride would take preference over a $2 ride—big money first and everyone was satisfied at that I soon had eighty numbers out. I sent down for more gas, and that evening after paying the farmer $10 and my gas and oil—buying two new inner tubes, I had $160 left. I had only been averaging 60 to $60 a day and some days I did not get anything This $160 looked good, so I decided to try the same thing next day.

The System Works

Next morning a couple of hundred were waiting around the ship at 8 a. m. Usually one does not get any passengers until the afternoon, but here I was making six or seven trips an hour and getting $12 to $20 an hour, and with about half that time as actual flying or motor hour. There was no stopping the motor except for gas. The plane flying continually over the town brought out more people. The farmers and working people not only rode but found it was a real treat and would ride again, urge their neighbors to go, send their wives and children up, and the more that rode the more boosters I had. People even came in from nearby towns. That night I was very tired, but I had $170 more in my pocket and, very important, the first $160 was still intact, none of it being spent for hotel bills, while waiting around, or on gasoline to get to a new town.

To make a long story short, they came every day that week and I averaged over $150 a day, and this in a town I thought was a dead one I took the profits of the week and bought a brand new Aeromarine with an overhauled OXX6 motor for $700 and had $200 left

A Different Experience

I was booked on Sunday for a nearby summer resort town. A lot of wealthy people came there, so I put the price up to $5 I took in $60 that afternoon, Monday $15, Tuesday $25, Wednesday and Thursday nothing (windy), Friday $20, Saturday $39, Sunday, being cold and rainy, nothing—a total of $150 for the week My hotel bill for myself and my mechanic was $60, mechanic's salary $30, gas and oil $20, and incidentals $20, or $30 expenses for the week, leaving $20 to take care of my own salary and the wear and tear of the machine

This led me to philosophize and I sum up the situation like this. It is better to charge low prices and get a volume of work than to get high prices and a limited quantity of work. I admit it does not sound reasonable to think that there is more profit in $1 or $2 rides than at $5 per ride, yet that is the way it figures out for me As the overhead expense goes on merrily all the time, if one takes in some money every day there is no need to take out several days' overhead of the profits.

At high prices the pilot works only a short time every day At low prices there is money coming in every hour. I have begun work as early as 6 a. m. in the morning That is not possible at $5 rides.

Some will say there is a rock in every landing, and wear and tear on the motor But my premise is that these joy rides only ought to be tried on good fields. It is not right to fly where there is a risk in hitting trees and wires, and if a pilot cannot make an indefinite number of landings without cracking up he has no right to fly. The wear on a landing gear and wheels is to be considered, but a good second hand gear for a Jennie ought to be bought for $25 and wheels for $5 each. One set ought to last a season.

Simple Economics

The Curtiss motor can be overhauled in a week. I buy my pistons in Philedelphia at $2 each, bearings at 25 cents each, and my overhaul doesn't cost over a hundred dollars. This is giving a service of 5,000 mi. at a cost of $100, or 2 cents per mile for motor wear. I can get a good new motor for $250 or 5 cents per mile.

My gasoline runs 10 gal to the hour, though in carrying passengers where one is changing them half the time, 10 gal will do 2 hr work with about 50 cents worth of oil, so the cost figures out as follows:

Gas and oil	$3 00
Engine wear at $0 05	0 10
Recovering ship	0 10
Repairs	0 10
	$3 30

A two-passenger OX5 Standard or Jenny will give an income of $24, and deducting the operating cost ($3 30) will leave a profit of $21 70 per hour of motor time, or 2 hr field work Using a single passenger plane at six trips per field hour or twelve trips to one motor hour, we have $12 — $3 30 = $8 70 per motor hour profit

Making Real Profits

I have an Aeromarine that carries four passengers with a 180 hp. Hispano which burns 15 gal gas and 1 gal of oil This gives me at the above rate $24 revenue per field hour or $48 per engine hour Operating costs and profit then work out as follows per motor hour

Gasoline	$7.50
Oil	1 25
Motor overhaul	0 20
Repair	0 10
	9 05
Revenue	$48 00
Operating costs	9 15
Profit	$38 85

If one has to talk 20 min. with a man to get him to ride, or talks to three or four prospects to every one that rides, then starts up the motor, warms up, then rides again waiting half an hour before getting another passenger, then it is worth $5 a trip The same remark applies to working in a fair, where the pilot is idle several days and has to make good in a limited time, or if he depends only on Sunday business. But one can naturally operate more cheaply if there are always passengers on hand. Incidentally, one day I took up ninety-three passengers in a Jenny, one at a time, in a snow storm at Chester, Pa. I wonder if there are any other records that can equal this.

Popularizing Civil Flying

The airplane, if it is to compete with other forms of transportation, will have to compete in rates to some extent. If it does not, it will stay in the position of specialized work.

Prices on all war planes are cheap There are eighty million people who would ride at these cheap prices, for most of them will spend 1, 2 or 3 dollars a week. This will wear out the war planes, create a demand for airports and also for a four or six passenger plane that can be operated cheaply. And when these eighty million people once get into the air, there will come a demand for longer trips, and to my mind it will then only be a short step between this stage and that of a universal demand

Pilots who can fly without cracking up can make money at this game, and when the demand becomes large enough, our designers will produce a plane that will carry a number at a low cost

Moral of the Story

Instead of seeing how much one can get out of aviation, pilots should see how much they could put in it. If they would realize what value they could give to those who have their interest newly awakened, the game would take on new life Instead of "spoiling the game," I believe it would give it a big boost Sort of a case of "Giving it the best you have and the best shall come back to you"—and it does.

LIGHT PLANES AND GLIDERS

Edited by Edmund T. Allen

The Rickenbacker Trophy

Captain Rickenbacker has not allowed the automobile to affect his interest in aviation He was among the first to see the possibilities of the light construction In 1922 he offered his Trophy for the glider making the greatest distance in a single flight Captain Rickenbacker put up the Trophy for an event in the Glider competition which was projected last year at Oakland, Calif The lamentable failure of the promoters of this meet to secure the funds for prizes and expenses brought the attempt to an ignominious end, for this reason the Rickenbacker Trophy has not as yet stood as the goal for any competition Accordingly one is glad to learn that the donor may transfer the trophy to the light plane field It is *true sport* of him to do this

It is to be hoped that this transfer may furnish competition on the basis of real light plane performance,—economy, not speed, just as it was offered for real glider performance, distance rather than duration Indeed, we now have too many speed events, and almost no recognition of the long suit of the light plane.

One of the proposals for its competition is that of a flight from Dayton to Detroit, and the event is to take place immediately after the Dayton races. There is of course the probability that this will be made a straight speed race, starting at scratch in Dayton and ending in Detroit with the award going to the first man to arrive there This is the easiest way, and possibly it may offer the least administrative difficulty But the administrative difficulties appear to be greater than they are This race could be made much more useful as an economy event The tanks might be sealed officially at the start, and officially broken at the end of the trip. The pilot who has travelled the distance on the least fuel will secure the first prize; the next least, the second prize, and so on. This economy event would make the Rickenbacker Trophy competition more important in its influence upon the development of the light plane than all the related events at the Dayton races. Several cash prizes in addition to the Trophy would be an assistance to amateur builders that is more than justified

To the designer there is no this way an incentive, lacking at the other events, to submit a machine that is not a mere speed freak Perhaps there may be built the light plane designed for all round performance; low landing speed, quickness in climb, large speed range, ease of folding and handling on the ground,—in a word the machine which might give to the man of affairs a carrier that with respect to degree of service is comparable to his roadster By imposing this economy feature upon the competition for his Trophy, Captain Rickenbacker will deflect aeronautical design in the direction of the more genuine usefulness of the light plane

It must be remembered that as far as the Dayton races are concerned an "all-round" light plane can take no prizes unless something is put forward to support its intentions. Indeed, it is worth noting here that the prizes for these aeronautical events have always been insignificant in comparison to the effort and investment which the machines represent A few hundred dollars for a first or second prize has been considered sufficient inducement to attract aeronautical entries from almost anywhere At the St Louis Races there were about twelve big events and fifty prizes; the machines entered represented an investment of over $2,000,000, but the prizes made a total of only $13,000 The prize list at the Dayton Races more than triples this amount. We hope that the prizes will continue to increase in size until they amount to some consideration on the economic balance sheet of the winners

Foreign Entries in the Schneider Cup Race

Three Italian and Two British Planes Challenge Three Ships Entered by U. S. Naval Aviation

Certainty of international competition in the Schneider Cup race which will be held in Baltimore on Oct. 24-25, 1924, is contained in two cablegrams received by the Contest Committee of the National Aeronautic Association from the Aero Clubs of Great Britain and Italy.

The Entries

The Royal Aero Club of Great Britain advises that it has entered two machines, while the Aero Club of Italy has entered three machines. The details of the entries are not available, but it is understood at the Navy Department that the British machines will be one Gloucestershire Mars float plane and one Supermarine flying boat. According to private information from Italy, printed in our issue of March 31, four Italian firms are building seaplanes for an elimination contest the Aero Club of Italy will hold to select the Schneider Cup challengers These firms are Macchi, Dornier's Italian plant at Pisa, Piaggio and the Cantieri Navali Monfalcone

Incidentally, the Italians have bought some of the record breaking Curtiss D12a motors to put in the planes which they will use in this race. They have won two legs on the trophy and as the deed of gift makes the winner of three trials in consecutive years the permanent owner, we may expect our friends from the Mediterranean to give us quite a run for the money.

As the Bureau of Aeronautics of the Navy Department proposes to enter three planes in the Schneider Cup race, there are now eight competitors on the list, which should make the event a first class race

As has been stated before, this year's Schneider Cup race will be organized by the Flying Club of Baltimore, which has obtained preliminary sanction to that effect from the Contest Committee.

Prizes

The following prizes will be awarded for the first, second and third places in the Schneider Cup Race;

Silver cups to the first three finishing will be awarded by the State of Maryland through the courtesy of His Excellency Governor Albert C Ritchie.

Silver cups will be awarded to the pilots taking first, second and third places by the City of Baltimore, through the courtesy of the Honorable Howard W Jackson, Mayor of Baltimore City

Gold, silver and bronze plaques will be awarded to the pilots taking first, second and third places by the Baltimore Sun and Evening Sun

A prize of $500 in gold will be awarded to the visiting constructor entering the plane winning highest honors.

Other Contests

Three races will be held during this meeting. On Friday, the 24th, the Baltimore Sun Trophy Race will be flown. It will be open to a class of seaplanes decided by the Contest Committee of the National Aeronautic Association. $1,000 in prizes and a silver cup are offered for the winners of this race Both the prizes and the cup will be donated by the Baltimore Sun and Evening Sun At 2 00 p. m. the same day the Flying Club Trophy Race for seaplanes will be held. The class will also be decided by the Contest Committee of the N A A and announced at a later date Prizes for this race are $1000 and a silver cup donated by R. W Alexander, President of the Flying Club of Baltimore.

The Navigability and Seaworthiness Test for the Schneider Cup contestants will be held at some later announced time on Friday, so as not to conflict with other events, and in the afternoon of Saturday, the 25th, at 2.00 p. m., the Schneider Cup Race will be flown.

Provisions will be made at Bay Shore Park to handle a crowd of 10,000 motor cars and 30,000 people The park is about 14 mi. from the center of the city by good road and fast electric train service The facilities at this park were pronounced by Col Frank P. Lahm, Chairman of the Contest Committee, N.A.A., as being almost ideal for such an event

Accommodations for Race

In addition to hangar accommodations, there will be provided at Bay Shore Park, in the restaurant building quarters for at least fifty men, and these men will be messed at this same building. The definite provisions for taking care of mechanical personnel are that the Flying Club agrees to house and feed, free of charge to the contestants, three men per plane in addition to one crew captain per team. The pilots will be put up at the Southern Hotel in Baltimore, and will be furnished with room free of charge during their stay. The Southern Hotel is donating its services in this particular instance and is offering hearty cooperation with the Contest Committee of the Flying Club It has been designated as Aviation Headquarters for the race, and a separate lobby will be provided for air enthusiasts during this meet

R W Alexander, President of the Flying Club, is giving much of his time to see that the race is handled in a manner befitting the importance of this international event. The management of the race will be in charge of W. D Tipton, Secretary of the Club

The various sub-committees have not yet been announced. Preliminary arrangements are being made, the contract for the park is signed, and arrangements have been made to survey the course. This work will be done by the Topographical Survey Commission of Baltimore City as soon as milder weather allows this work to be done.

A Successful Club

The Flying Club of Baltimore enjoys the confidence of everyone because of past years of conscientious effort to advance the cause of flying Its success has been due, in addition to the support of members giving of their time and money, to several public spirited organizations without whose help the club's efforts would have been almost useless.

First, there is the Bethlehem Steel Co., who, through the interest of W Frank Roberts, the local general manager, and past president of this club, gave it the use of Logan Field for about five years, free of rental. This company has now leased to the club this property valued $200,000 for an additional term of five years at the rate of $2500 per year This amount could not have been financed without outside help, and when approached, Mayor Jackson and the Board of Estimates, Baltimore, agreed without argument to help the club to the extent of $2,000 per year for the next five years, and General Reckord, past president of the Club, agreed to pay, on the part of the State, $500 per year for the same term In addition to this contribution, the State expects to spend $16,000 on Logan Field for the National Guard Air Unit.

There are now at Logan Field in course of erection two new steel hangars. The old group of buildings will be gradually eliminated and the ground made part of the flying field, so that when this project is completed Baltimore will have a most excellent flying field

The Guarantors

This race could not have been obtained without the aid of certain public spirited citizens each of whom pledged themselves as guarantees the Club against deficit in holding the race up to $300 Herewith follows the list of those who have signed guarantees R W. Alexander, W W Alexander, W G Baker, Jr., Van Lear Black, S. Proctor Brady, John C Brydon, Carl D Fenhagen, Jr., Robert Garrett, John A. Hambleton, Charles A. Masson, Sifford Pearre, Milton A. Reckord, Charles B Reeves, W. Frank Roberts, Dudley Shoemaker, George C. Smith, W. D. Tipton, Henry M Warfield.

AIRPORTS AND AIRWAYS

Chicago News

By R. W Schroeder

The aeronautical atmosphere about Chicago is showing signs of a remarkable improvement as the flying season approaches. Pilots, aircraft operators and owners, and, generally speaking, all those actively interested in aviation, are beginning to pull in the same direction, as they are finding out that it is to the advantage of all concerned to work with, rather than without, the other fellow The writer has found that in practically all cases the men want to cooperate and to coordinate their efforts.

The pilots, operators and owners of aircraft have certain definite problems before them in which they are vitally interested The same applies to the Reserve Air Service, the National Guard, ex-Air Service men of the American Legion, members of the Aero Clubs, the Air Board, the Model Airplane activities, etc. But as the same problems do not always interest the different groups, it follows that each group tends to pull for his own interests, so that each is making less headway than if these groups combined their efforts

Several of the above named groups are now coordinating their activities They are learning each other's problems and are making an honest effort to assist each other in their solution This is a hopeful symptom and warrants the belief that aviation in Chicago will make a greater progress this year than last

* * *

Readers of these Chicago News are requested to send local news of interest by letter or phone to R W Schroeder, 207 E Ohio St, Chicago Phone Superior 2300

* * *

Our very dear mutual friend Tony Yackey is in the hospital undergoing an operation, and as usual he is full of pep, but a call from some of the boys now and then would help him pass many a long hour He is in the Hines Hospital, Speedway Park, Maywood Those who don't know him have here a chance of getting acquainted—and they will never regret it.

* * *

Owing to the unusually soft condition of its field the Heath Airplane Co is unable to do any actual flying at this time However they are utilizing this time to get the equipment in shape for the big races.

Construction has started on a six-place Hisso equipped job, somewhat on Standard lines, which will be entered in the On-to-Dayton race The Heath Feather, a motorcycle engined sport plane, which has also been entered in the On-to-Dayton race as well as the light plane events, is being overhauled The Heath Favorite, which last year took third prize in the On-to St Louis race, will also participate this year, and the Company hopes will make a good showing, although the conditions of the race are somewhat stricter than they were last year

An interesting experiment just completed in the Heath shops is the change of the intake valve action on an OX5 motor The regular valve spring has been eliminated and in its place a positive connection substituted With the regular action, where one spring has to overcome another, the push rod does not follow the depression of the cam, but skips part ways as soon as the speed of the engine is increased, until at the greatest speed it barely touches the flat or depressed section of the cam The valve action thus becoming irregular, a greater speed than 1400 to 1500 r.p.m is impracticable. With the improved valve action it was found possible to increase the r.p.m's in 1650, at which speed the engine develops practically 135 hp

The Heath flying school is in full swing all the year round, but, as stated before, no actual flying is being done for a week or two until the ground dries sufficiently to take off In the meantime, ground school work is progressing steadily. The school has at all times from ten to fifteen students, divided into day and night classes. The students are not only taught the construction and repair of ships and motors, but also the use of wood working and metal working machinery, the Heath shops being among the most complete in that respect in the country.

* * *

The Illinois Model Aero Club held another of its many winter meetings March 21, which are always of great benefit to the youngsters in the commendable work of model design and building. Two fine talks were given to the members and visitors on "How to Build Speed Models" by Mr Lucas, and "Characteristics of Rubber Power" by Mr Brock. This model organization is most feared by other contestants at any of the big meets, as they "cleaned up" at St Louis last year They will bear watching at Dayton this year These boys are willing to aid any other city in the country by furnishing them information on how to get started in this work which leads into the large power aircraft in a few years. Edward Lund has been made Chairman of their Contest Committee. They put on one of their Club meets at Ashburn Flying Field March 27, in which useful prizes were awarded in addition to Ribbons to the winners of the various events.

Shorty says "All efforts to get news from Dave Behncke at Checkerboard Field have failed That Dave is too busy counting his last year's earnings and scraping varnish."

"Elmer Partridge was last seen by Shorty going in to pay his income tax and a reward has been offered to anyone who will notify Shorty as to how to get news out of him when he is found."

The Milwaukee Airplane Company's field at New Butler, Wis., which is operated by Dan Kiser, is a very fine field and the plan of operation seems to be a very logical one. The county spends $1500 a year in the maintenance of the field, and they lease it out to the Milwaukee Airplane Co for $600 a year They are now putting in fifty loads of crushed rocks and screenings around the hangars

House Gives Air Mail $2,750,000

The House of Representatives on March 29 agreed to appropriate $1,500,000 for operation of the New York-San Francisco Air Mail Service during the fiscal year beginning July 1. It also approved an additional appropriation of $1,250,000 for operation of the Air Mail Service by night flying

Previously the Senate had agreed to appropriate $1,500,000 for continuance of the trans-continental service and a like amount to take care of night operations The House, passing on the items as provided for in Senate amendments to the Postoffice-Treasury supply bill, agreed to the one, but scaled down the other by 250,000 Senate concurrence in the night flying amendment fixed by the House is now necessary

Air Training Center at Fort Leavenworth

An aviation training station will shortly be established at Fort Leavenworth by the Army Air Service.

Erection of hangars will begin at once, Brig. Gen Harry A Smith, commandant, said The hangars probably will be in the Missouri bottoms north of the fort

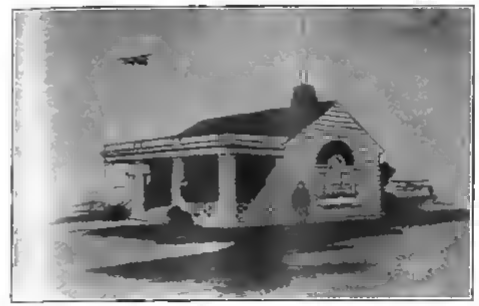
Four planes will be used at first. Four officers and thirty enlisted men will be sent to the fort from other stations.

Kelly and Macready Get Mackay Trophy

Upon recommendation of Secretary of War Weeks and Maj Gen Mason M Patrick, Chief of the U S Air Service, the National Aeronautic Association announces the award of the Mackay Army Trophy to Lieuts. Oakley G. Kelly and John A Macready, A S, for their coast-to-coast flight on May 2 and 3, 1923

Ae. C. of Mass. Clubhouse

The accompanying sketch shows the new club house which the Aero Club of Massachusetts proposes to build at the Boston Airport as a memorial to the aviators killed in the great war. All plans and specifications are complete, and the necessary land has already been leased from the Commonwealth. The major portion of the cost will be borne by



Sketch of club house which the Aero Club of Massachusetts proposes to build at Boston Airport as a memorial to aviators killed in the War of 1914-18

the club, which for some time past has been devoting the proceeds of its annual aviation ball for this purpose

A building fund committee consisting of Porter Adams, Chairman; Roger Armory, Charles R Codman, Arthur Richmond, Theodore Hedlund, Charles E Jeffrey, and Allan Forbes, Treasurer, has been formed for the purpose of creating public interest and support for the project, which has the hearty endorsement of Admiral L. R De Steiguer, Commandant of the First Naval District, Maj Gen. A. W. Brewster, Commanding the First Corps Area, and Maj Gen Clarence R Edwards, (Retired) State Commander of the American Legion

New Waco Passenger Carrier

The Advance Aircraft Co. of Troy, Ohio, manufacturers of the popular Waco three-seater with 90 hp Curtiss OX5 engine, have under construction a commercial cabin plane which will accommodate six persons in a cabin and a seventh passenger in the pilot's cockpit. The machine will be a single bay type tractor biplane, with the Aeromarine 2A wing curve, which is giving a very good performance to the Waco three-seater The span will be 39½ ft, the wing area 530 sq ft., and the weight empty 1,750 lb

National Balloon Race

The Contest Committee, N.A.A., has received seven entries for the National Balloon Race, to be held at San Antonio, April 23, next The particulars of the entries are given in the table below

Civil Service Examination

The U S. Civil Service Commission announces that an open competitive examination for the position of Junior Engineer (Aeronautical) will be held throughout the country on May 7. It is to fill vacancies in various branches of the Government service at an entrance salary of $1,860 a year.

Applicants must have been graduated with a degree in engineering, preferably aeronautical engineering, from a college of recognized standing, or must be senior students in such courses and furnish within three months from the date of the examination proof of actual graduation. Applicants who have completed two years of an engineering course in a college of recognized standing, may substitute for each year lacking of the required college work, one year of experience in aeronautical engineering

If the applicant has completed two full years of engineering study in a college of recognized standing, he may substitute for each of the additional years of college work a year of engineering experience in aeronautical engineering. Each year of such experience must have been in strictly technical work, and the applicant must show advancement in accomplishment and content comparable to the progression of a complete college course

The examination will consist of general physics and chemistry, pure and applied mathematics, practical questions on aeronautical engineering, and a rating on education, training, and experience

Full information and application blanks may be obtained from the United States Civil Service Commission, Washington, D. C., or the secretary of the board of U. S Civil Service examiners at the post office or customhouse in any city.

Standards and Standards

In our issue of March 24, 1924, there were reproduced under the head "The Need of Federal Air Regulations" parts of a letter which called attention to the state in which some of the original, unimproved Standard airplanes are operated in this country. The writer stated in particular, that with the old rigging as originally fitted to this ship, where the flying wires are pulling against the threads of the bolts, the safety factor (with a 150 hp. Hispano engine) is approximately of the order of three

It appears that this item has been considerably misconstrued by some of our readers, one going so far as to assume that this faulty rigging still exists in the numerous improved and modernized Standards that are being sold by reliable constructors and dealers. It is therefore well to set the misgivings of these persons at rest by stating that nothing could be further from the truth, and that none of the Standards modernized by reputable firms such as the Curtiss Aeroplane & Motor Co or the Lincoln-Standard Aircraft Corp has any of the structural defects of the original Standard J1.

These and other responsible firms maintain a strict inspection service to detect flaws in the material used in these surplus war aircraft, and deteriorated parts are promptly replaced before the machine leaves the shop. Anyone who has made a visual comparison between the original Standard J1 and some of its modernized sisters, such as the Lincoln-Standard or the Curtiss C-6 Standard will realize what a world of difference there exists between these ships

ENTRIES IN NATIONAL ELIMINATION BALLOON RACE

Entrant	*Pilot*	*Aide*	*Name*	*Size*
H. E. Honeywell	H E Honeywell		The Cooperative Club of Kansas City, Mo.	78,000 cu ft
U S Air Service	Maj Norman W. Peek, A.S.	Lt. Robt. E Rohillard, A.S.	Air Service	80,000 cu. ft.
" " " "	Capt. Edmund W Hill, A.S	Lt. Jas. F. Powell, A S.	" "	80,000 cu. ft
" " " "	Lt. Ashley C. McKinley, A S.	Lt. Lawrence A. Lawson, A S	" "	80,000 cu. ft
Aircraft Development Corp.	Herbert V Thaden	S. A. U. Rasmussen	Detroit	80,000 cu ft.
B A Fournier	B H Fournier		San Antonio	50,000 cu. ft.
Goodyear T & R. Co.	W T Van Orman	C K. Wollam	Goodyear III	2,200 cu. m. (77,692 cu. ft.)

NOTE—The Air Service has designated Lieut. Max Moyer, A.S., as Alternate Pilot and Operations Officer

Dayton News

By Maurice C Hutton

Flying the TP1, a new pursuit ship designed and built at McCook Field and equipped with a side-type supercharger, Lieut Harold R Harris, A S, broke the altitude record carrying a useful load of 250 kilos on March 28 The flight was made in the presence of Orville Wright, director of aiming and observing, L Luzern Custer, timer, and Paul Ackerman, observer, representatives of the F A I The plane was in the air about two hours during which time it reached an altitude of 28,411 ft

Officials are not certain whether the mark will be recognized by the F A I because of the recent change in the ruling on how much a record has to be exceeded to become official The previous mark was 27,777 ft, and was made by Sergeant Bory at Bourget, France, on June 1, 1923

Four barographs were carried on the flight, two of which were calibrated immediately while the others were sealed by Mr Wright and sent to the Bureau of Standards

Maj Lawrence W McIntosh, commanding officer of McCook Field and chief of the Engineering Division for the last four years, has received transfer orders effective Sept 1, 1924 He will enter the Command and General Staff school at Fort Leavenworth. The transfer is being made at this time in conformance with regulations that require officers to spend one year in five with troops. Major McIntosh graduated from the Engineering Division school before succeeding Maj Thurman H Bane, as commandant of the station

While stationed in Dayton, Major McIntosh supervised many of the largest undertakings of the Air Service, including the sensational non-stop flight across the continent by Lieutenants Macready and Kelly, and assembling and first flight of the giant Barling Bomber He is well known to citizens of the city having appeared on numerous occasions explaining the work of the Air Service with emphasis on the importance of research work such as is done by the Engineering Division

Dayton is eagerly awaiting announcement of who the new chief will be because of the important part he will have in the International Air Races next fall Maj J F Curry, a popular McCook Field officer, attending the Engineering school, is being considered among the successors, according to rumors

Maj William R Blair, meteorological officer at McCook Field, left March 31 for Dutch Harbor, Unalaska, where he will make weather reports for the world cruise fleet He went in command of Seattle, Wash, taking a coast guard cutter directly to Dutch Harbor while the fliers skirted the coast

The most important part of the assignment will be to diagnose the weather prevailing during the 890 mi non-stop hop from Attu, in the Aleutian group, to Shumuski The officer took a set of instruments from the station and will be assisted by local observers.

* * *

At one time last month there were twenty-one DH's stored in the hangars at Wilbur Wright Field awaiting favorable weather to be ferried to points in the East, Middle West and South The machines were rebuilt at the depot under direction of Maj. J. H Rudolph. On completion of the order, six Martin Bombers were brought in from Langley Field, Va

* * *

Brig Gen Dwight E Altman, commanding officer of the Fifth Army Corps Area was a visitor at Wilbur Wright Field where he inspected the 88th Observation squadron On his arrival he was greeted with eleven salutes from a field piece and an aerial exhibition was held in his honor

* * *

The first complete and accurate catalogue of airplane and motor parts in the history of the Air Service has been compiled by C H Calder, of the field service section, Wilbur Wright Field

The catalogue is arranged in three sections, giving the parts as the ship is assembled, in their alphabetical order and according to number Among the significant questions answered are that there are 1,100 parts in a Liberty engine and 5,760 in a Martin Bomber

Delivery of the new DH4M1's has been started at McCook Field by the Boeing Airplane Co of Seattle, Wash. They contain many improvements over previous models, being faster, easier to fly and sturdier.

Among the nine changes incorporated in this job are installation of gasoline tanks in the upper wings, use of a new type wing for "speeding up" the plane, adoption of wider landing gear, and a fuselage built of welded steel tubing instead of wood

* * *

Succeeding Capt. E E Adler, who is now a patient in Walter Reed Hospital, Washington, D C., Maj. George Brett, former commanding officer of Crissy Field, has assumed charge of the field service section, Wilbur Wright Field In this position he will be advance man in the United States for the world cruise

* * *

The airplane patrol at Wilbur Wright Field was called into service again this week to convey another prisoner to headquarters of the Fifth Army Corps Area at Columbus

Audrey Stuck, an alleged deserter from the Eleventh Infantry, was the prisoner so accommodated He was arrested on suspicion by Dayton police and later found to be a soldier absent from camp without leave

The sky patrol wagon was used for the first time at the station several months ago The prisoner escaped from the Fort Hayes guard house sometime later, however

* * *

As the AVIATION correspondent in Dayton is a very busy man, he would appreciate it if those taking an interest in the flying game at Dayton and environs would send to him timely news by letter or phone at *The Dayton Herald*

Kansas City News

With the continuation of the bad weather of January until the month of February and the first week or two of March, actual flying at Richards Field, Kansas City, has been limited. The actual man hours for the military were 26 hr. 30 min., by officers assigned, 6 hr 50 min., student officers from Ft. Leavenworth, 10 hr 30 min., Reserve officers, 9 hr 10 min

During the month eighteen flights were made by the Commanding Officer of Richards Field for a total of 3 hr 25 min., 103 flights by the officers assigned to Fort Leavenworth at the General Staff School, and only nine flights by the Reserve pilots. One cross-country was made by the military to Fort Riley, Kan

Commercial activities suffered heavily as visitors and transients out to the field have been few and far between Overhauling of motors, riggings and fuselages has certainly been in order and the first nice days of Spring are being eagerly waited for Next month in all probability will see a big increase in flying, both for the commercial and military

The training camp for Air Service Officers, Reserve Corps, of the Seventh Corps Area, will be held again at Richards Field The camp this year is to be divided into two classes of two weeks' duration each, 35 officers being taken in each class. The training squadron used at this camp will arrive from Fort Leavenworth some time in June and probably remain until the last of August C. L Tinker will be in command

Flying in Tulsa, Okla.

The Southwest Airplane Co of Tulsa, Okla., maintains an active flying field 5½ mi northeast of that city The field consists of 120 acres of smooth and well drained ground and is equipped with two steel hangars, 65 ft. by 100 ft It also includes all the necessary equipment for servicing, overhauling and rebuilding airplanes, such as wing rooms, motor shop, gasoline and oil pumps, etc A mechanic is always on the ground to give service, and an ample supply of spare parts for planes is on hand A cement road connects the field with the city D A. McIntyre, General Manager of the Company, is in active charge of the field.

The Southwest Airplane Co has been at this location for four years, doing all kinds of commercial flying, such as passenger carrying, aerial photography, instruction, etc The firm has now eleven planes on the field and is flying all the year round.

Fairchild Increases its Photo Fleet

About a year ago the Fairchild Aerial Camera Corp was putting planes in order to handle its photographic contracts. In 1923 two machines were purchased—a Curtiss flying boat and a Fokker CII biplane—and three others were obtained on exclusive lease Orders have recently been placed with the Huff Daland Co. for two more ships—one land plane and one seaplane This latter ship has an interchangeable landing gear and wheels may be substituted for pontoons when the need arises. Both planes are powered with Wright 200 hp engines The seaplane will be used by the Canadian Fairchild Co.

Prior to the placing of this last order there had been no demand for specially designed and constructed commercial photographic planes For this reason a great deal of investigation was necessary to determine the type of plane which would fill the requirements for aerial mapping The burden of such investigation naturally fell on the Fairchild organization due to the wide scope of their activities.

According to R H Depew, Jr., in charge of the Fairchild Flying Division, these new HD planes have all the refinements necessary for the various phases of aerial photography. They are the result of three years' study on the part of Fairchild executives, engineers, photographic experts and pilots.

In order to be suitable for aerial photographic work, aircraft must permit the best possible vision ahead and downward for the pilot, that is they should have an angle in a vertical plane from the horizontal backward and downward to as near vertical as possible The pilot's cockpit should have triplex windows in the bottom, thus allowing full vision directly beneath Arrangements must be made so that cameras with wide angle lenses may be mounted so as to photo vertically downward without including part of the plane

As for load, at least 5 to 6 hr fuel in addition to pilot and photographer and 200 lb. of camera and other equipment, is desired A high speed of not less than 110 mi /hr. is essential on account of the high winds which are often encountered at high altitudes A quick take-off and rapid climb, together with the ability to get in and out of small fields, is another requirement of photographic planes. They must be steady in flight and have a working ceiling as a land plane of not less than 15,000 ft., and as a seaplane as near that altitude as is possible Flying boats do not lend themselves readily to aerial mapping work on account of the pilot's restricted vision Twin float seaplanes, however, are excellent for this work

Stop over at Muskogee

AVIATION is in receipt of a letter from C. C Lydick, general secretary of the Chamber of Commerce of Muskogee, Okla., which reads as follows:

"The entire citizenship of Muskogee—the 'Aviators' City of Hospitality,' is greatly interested in promoting the Air Service. For over three years members of the Chamber of Commerce have granted certain courtesies to the men of the Air Service as indicative of their lack of selfishness and as evidence of the hospitality of our people

"We wish to commend you and AVIATION for the splendid service you are rendering to the country in promoting aviation. Your publication is a splendid one and merits the support of every citizen interested in maintaining our country's leadership.

"Hot-Box Field at Muskogee is the intermediate stop between St Louis and San Antonio on the Air Service Model Airways, Southwestern Division You may wonder what it is like. We would sure like for you to see for yourself. We hope that you may use the enclosed courtesy card—the key to our city for visiting aviators. We wish you to consider this a personal invitation and an invitation to any flying men We like them Come to see us soon, take advantage of all the privileges to flying men, and come again often."

Civil air transport in Florida—Passenger flying boat Bulbon, of the Aeromarine Airways, carrying Governor Hardee of Florida and his staff over Miami Beach and Biscayne Bay

AVIATION hopes that many pilots will avail themselves of the splendid hospitality shown by the progressive citizens of Muskogee.

Utah Helium Reserve

A mineral reserve of 7,100 acres has been set aside by executive order of President Coolidge from which it is expected that much of the helium used by the Army and Navy for inflation of its lighter-than-air craft will be obtained. The reserve is in Emery county, Utah, and the greater part of the title is already vested in the United States.

While the United States already controls the greatest helium fields in the world, those in the natural gas fields of Texas, it has been felt desirable by the War and Navy Departments to preserve for national defense all other known helium deposits in the country, and it is in accordance with this policy that the President's order has been issued

The reserve is designated as Hehium Reserve No. 1 and by the terms of the executive order the reserve is withdrawn from all forms of settlement, location, sale or entry It is in eastern Utah, covering the Woodside anticline, a geological structure containing valuable deposits of helium bearing gas.

Governor Hardee Flies

Governor Cary A. Hardee of Florida and prominent state officials recently made a flight over Biscayne Bay in the passenger flying boat Balboa of the Aeromarine Airways, which maintains flying service between Florida coast points and Havana and other cross-water airports. Beside Governor Hardee, the party included Attorney General Rivers H Buford, State Treasurer J. C Luning, State Controller Ernest Amos, Fred C Elliott, chief drainage engineer, and Senator J B. Johnson

Italian Aero Engine Competition

The Italian air department has instituted a national aero engine competition for 5,000,000 Lire in prizes Two classes of engines may take part in this competition: (A) Engines of from 325 to 350 hp., which must maintain their rated power up to 13,200 ft (4,000 m.) altitude, and (B) Engines of from 450 to 500 hp., which must maintain their rated horsepower up to 16,500 ft (5,000 m.) altitude No engine may participate in the competition if it has been designed before 1922.

UNITED STATES AIR FORCES

U. S. ARMY AIR SERVICE

Army Orders

Following named enlisted men, hdqtrs company, 9th Inf, Fort Sam Houston, to A S, Primary Flying School, Brooks Field, for appointment as flying cadets, Pvts 1st cl John W Lieser and Howard Van Horn

First Lieut. Carlton F Bond, A S, Aberdeen Proving Ground, to Walter Reed General Hospital, for observation and treatment

Maj Rush B. Lincoln, A S., Scott Field, designated student, Army War College, 1924-5 course

Maj Millard F. Harmon, jr, A S., asst prof military science and tactics, University of Washington, Seattle, designated student, Army War College, 1924-5 course

Orders Jan 24 First Lieut. Max F Schneider, A S, amended, relieving Lieutenant Schneider from duty Kelly Field, after one month's leave from June 5, to proceed New York City and sail on transport July 10 for Canal Zone, for duty with A S., Panama Canal department

Orders Jan 10, granting Sec Lieut Townsend Griffiss, A S, one month fifteen days' leave, revoked

First Lieut William H Bleakley, A S, Aberdeen Proving Ground, to Walter Reed General Hospital, for observation and treatment

Sec Lieut Henry I. Hodes, A S, (Cav.), relieved A S. detail and further training Primary Flying School, Brooks Field, and assigned 4th Cav, Fort McIntosh.

Two months twenty-six days' leave to Capt Harold M McClelland, A S, from April 25, with permission to leave continental U S

First Lieut Byron T Burt, jr. A S, Kelly Field, to Langley Field, after leave granted

First Lieut George H Brown, A S, Chanute Field, to Walter Reed General Hospital, for observation and treatment.

Sec Lieut Elmo Shingle, 34th Inf, Fort Eustis, detailed A S, Primary Flying School, Brooks Field, for training

Capts. Clarence F Hofstetter and James D. McIntyre, Ordnance department, Brooks Field, to Kelly Field for purpose of familiarizing themselves with A.S ordnance material and training methods

Following named A S officers from Primary Flying School, Brooks Field, to Advanced Flying School, Kelly Field, for training: First Lieut Jack C Hodgson Sec Lieuts Will W White, Paul W Wolt, Wallace E Whitson, Russell J. Minty, Aldra R Crawford, David M Schlatter, Joseph H Hicks, Stewart W Towle, jr, and Herbert K Beasley

First Lieut Stanley M Umstead, A S, Brooks Field, to A S, Philippine department, Manila, transport sailing San Francisco May 5

First Lieut Clyde V. Finter, A S, Mitchel Field, to Langley Field, on expiration of present leave

One month's leave to First Lieut Frank L Cook, A S., on arrival in U S, with permission to apply for one month's extension

First Lieut Howard C Brandt, A S., Camp Alfred Vail, to Walter Reed General Hospital, for observation and treatment.

Twenty-nine days' leave to Sec Lieut John H Pitzer, A S, from March 24

First Lieut Courtney Whitney, A S, Bolling Field, to A S, Philippine Department, Manila, by transports sailing New York and San Francisco July 12 and Aug 1, respectively

Orders Dec 7 First Lieut. Clyde V Finter, A S, amended, granting one month's leave from March 25

Lieut Col Arthur G Fisher, A.S, Brooks Field, on completion present temporary duty, Naval Air Station, Lakehurst, to A S Tactical School, Langley Field, for instruction beginning Oct 15.

Lieut Col Benjamin D. Foulois, A S, relieved from duties as assistant military attache for aviation, Berlin, Germany, effective May 1, to return to U S for 1924-25 course, Command and General Staff School, Fort Leavenworth, after leave granted.

Capt. Donald M McRae, A.S. (Inf.), from detail A fi, Brooks Field, to Fort Sam Houston, for duty with Inf, Sec. Div

Following-named A S. officers, Primary Flying School, Brooks Field, to Advance Flying School, Kelly Field: First Lieut. Charles Backes (Inf), Sec. Lieuts. Homer W. Ferguson (F A.), Kenyon M. Hegardt, James W. Fletcher and Thomas M. Conroy

91st Division Air Service Reserve

The 91st Division Air Service which operates from Crissy Field, Calif, in two years of steady flying has had but one forced landing, two major crashes, and not a single injury From July 1, 1923, to Jan. 1, 1924, the Reserve Officers flew 650 hr During January and February of this year 73 hr. and 276 hr, respectively, were flown, most of this time on Saturdays and Sundays, as the location of Crissy Field makes it impracticable for most of the officers to take time away from their work during the week.

There are now two active Squadrons at this field—the 316th, with the 316th Photo Section, and the 516th Intelligence Section comprising the 91st Division Air Service. The 372nd (Ninth Corps) Squadron is attached for training. The Division Air Officer acts as group commander. All of the commissioned personnel are active, that is, either fly regularly or attend the monthly dinners and classes.

On Feb 11 a very successful dance was held at the Oakland Auditorium at which, in addition to having a very wonderful time all around, a sum exceeding $1,000 was raised toward conditioning a field for reserve use in Oakland.

The equipment consists of seven JN6HI planes, all in splendid condition They are maintained by a Staff Sergeant and three privates, detailed from the 91st Squadron at Crissy Field

A Fast Flight

A fast flight from Buffalo, N Y, to Mitchel Field, was made on March 28 by Lieuts M L. Elliott and Homer B Chandler, A S Starting from Buffalo at 2.10 p m., with a favoring wind of 40 mi/hr, they arrived Mitchel Field at 4.31 p m. The distance by air is 318 mi and the average train time is ten hours

South of Binghamton, N Y, at a height of 6,000 ft, the fliers encountered a flock of 500 Canadian geese flying north in V formation They broke into circular formation in time to avoid a collision. If one of the birds had been hit the propeller probably would have been broken and a serious accident would have resulted.

Reserve Officers Finish Flying Training

The following officers of the Air Service Reserve Corps completed their fifteen days' course of flying training at the Primary Flying School at Brooks Field, San Antonio, Tex., recently: 1st Lieut. Wallace E Buchanan, 2nd Lieuts. Bledsoe Payne, Thomas O. Hardin and Horace Reeden. These officers reverted to inactive status. Second Lieut. Wm. P. LeBreton, O R C, reported at Brooks Field recently for fifteen days' training

New Flying Cadets

Seventy-four civilian candidates found qualified to be appointed flying cadets have been sent to Brooks Field, San Antonio, for a six months' course in primary training, which began March 15 Those who successfully complete this course will also take the six months' advanced course.

Obituary Notice

WILLIAM G MOORE—Born in Ohio May 28, 1882. Appointed from Nebraska. Pvt. 1 Cl, Av. Sec., Sig E.R.C., Feb 16, 1918 to May 3, 1918, 2nd Lt., Av. Sec., Sig O.R.C., May 3, 1918, to Sept. 21, 1918, Sec. Lieut., A.S., July 1, 1920.

Service—He was temporarily at the School of Military Aeronautics, Atlanta, Ga., from May 4 to May 7, 1918, en route to and at Kelly Field, Tex., to July 17, 1918, en route to and at Barron Field, Tex., on duty as Supply Officer, to April 15, 1921, en route to and at Miller Field, Staten Island, N Y., to March 10, 1922; at Mitchel Field, N. Y., with Air Park 7 to April 19, 1922; 1st Squadron, Observation, A.S., to Sept. 6, 1922; Hq, 9th Group, Observation, to March 30, 1923; en route to Hawaiian Dept. March 31, 1923 to April 17, 1923; on duty at Luke Field, Hawaii, with Hq, 5th Composite Group, to May 1, 1923; 65th Service Squadron to Oct 6 1923, Assistant to Constructing Quartermaster, Luke Field, H T, to Oct. 8, 1923, 23rd Bomb Squadron, Air Service, to March 27, 1924

He was killed in an airplane accident at Luke Field, Hawaii, March 27, 1924.

Examinations for Flying Cadets

Preparations are now being made for examinations to be held in April and July to secure eligibles for the class of flying cadets which will commence in September. Enlisted men of the Regular Army and civilians between the ages of 20 and 27 years, with at least a high school education, are eligible for this training. Those interested should communicate with The Adjutant General of the Army or the Chief of the Air Service, Washington

U. S. NAVAL AVIATION

Naval Orders

Lieut Robert L. Fuller, det Aircraft Squads, Battle Flt, to Naval Air Sta., Pensacola, Fla

Lieut. Forrest P. Sherman, det. Aircraft Squads, Battle Flt, to Naval Air Sta., Pensacola, Fla

Comdr Ezra G. Allen, det. Bu Aero, Navy Dept, to Bu Navigation, Navy Dept

Lieut Arthur C Davis, det Nav Air Sta, Pensacola, Fla.; to Aircraft Squads, Battle Fleet

Lieut. Thomas G Fisher, det. Nav Air Sta., Pensacola, Fla; to Aircraft Squads, Battle Fleet.

Lieut William S. Garrett, det. Nav Air Sta., Pensacola, Fla., to Aircraft Squads, Battle Fleet

Lieut. William N Updegraff, det Nav Air Sta., Pensacola, Fla, to Aircraft Squads., Battle Fleet

Lt. (jg) William C Allison, det. Nav. Air Sta., Pensacola, Fla; to Aircraft Squads., Battle Fleet

Lt (jg) George H De Baun, det. Nav Air Sta., Pensacola, Fla; to Aircraft Squads, Battle Fleet

Lt (jg) George C Haeberle, det. Nav. Air Sta., Pensacola, Fla, to Aircraft Squads., Battle Fleet.

Lt (jg) Kenneth C Hawkins, det Nav Air Sta, Pensacola, Fla, to Aircraft Squads, Battle Fleet

Lt. (jg) Clarence M. Head, det Nav Air Sta., Pensacola, Fla.; to Aircraft Squads., Battle Fleet.

Lt (jg) John H Hykes, orders 3-10-24 modified; to Naval Air Station, Pensacola, Fla.

Lt (jg) Malcolm E Selby, det Nav Air Sta., Pensacola, Fla., to Aircraft Squads., Battle Fleet

Lt Comdr. Augustine W. Rieger, det Bu Nav Navy Dept; to U S S Argonne

Lt (jg) Ernest W. Litch, det Nav. Air Sta., Pensacola, Fla, to Aircraft Squads, Battle Fleet.

Lt (jg) Elmer S Stoker, det. Nav Air Sta., Pensacola, Fla, to Dest. Squads, Battle Fleet.

Ch Gun William Everlin, det U.S.S. Florida, to Nav Air Sta, Pensacola

Air Carnival at Lakehurst

A demonstration of lighter-than-air activities in the Navy, to be held at the Naval Air Station, Lakehurst, N. J., during the late Spring or early Summer, has been authorized by the Secretary of the Navy.

The air carnival will be open to public attendance. It will feature the airship Shenandoah which has been under repairs for the past two months after her "night out" in January. In addition to flights of the Shenandoah, other events planned for the air circus include a free balloon flight, parachute jumping, demonstration of airplane maneuvers in which the Army will be invited to participate, and a come flight in a 5,000 cu. ft. meteorological balloon. The latter might be termed the flivver of lighter-than-air craft.

It is planned to throw open the Air Station to visitors on this occasion and afford them every facility for inspection of the various interesting features, such as the mooring mast, the enormous hangar, the helium stowage tanks and purification plant.

It is also expected that the airship ZR3, which is approximately the same size ship as the Shenandoah, will be an interesting exhibit.

Progress of Work on Shenandoah

The work of overhaul and repair on the airship Shenandoah, now under way at the Naval Air Station at Lakehurst, N J is proceeding satisfactorily, and it is expected that the airship will be ready for flight some time in May. The work of repairing the nose, damaged when the airship was wrenched from her mooring mast on the night of Jan 16, has been practically completed. Work is now going ahead on the tail surfaces of the ship, which were also damaged. The walkway girders along the keel, forming a part of the corridor that runs the entire length of the ship, are being completely renewed. The engines are also undergoing thorough overhaul. When the ship leaves her hangar in May she will carry five instead of six engines. The engine formerly located in the after section of the control car has been removed to make room for a new specially constructed long range radio sending and receiving set.

The water recovery apparatus, that will extract water from the engine exhausts and thus conserve ballast, is still at the Naval Aircraft Factory at Philadelphia. It is expected that the installation of this apparatus will take place within the next six weeks.

CALENDAR OF AERONAUTICAL EVENTS

March 25.	Start of the British World Flight. Southampton, England
April 6	Start of World Flight of the U. S. Army Air Service. Seattle
April 23.	National Balloon Race, San Antonio, Tex.
June 3-11.	International Aircraft Exposition, Prague, Czechoslovakia.
June 15	Gordon Bennett International Balloon Race, Brussels, Belgium.
June 21.	Annual F.A.I. Conference, Paris, France.
June 22.	Commodore Beaumont International Cup Race for high speed airplanes, Istres, France
July 5-6.	Zenith International Airplane Efficiency Race, Paris, France.
August.	"Tour de France des Avionnettes." International Round-France race for light airplanes.
Oct. 2-4	International Air Races, incl Pulitzer Trophy Race, Dayton, Ohio.
Oct. 24-25.	Schneider Cup Race, Baltimore
Dec. 17.	Twenty-first anniversary of the first successful airplane flight.

New Aero Engine Starter Under Test

An engine starter for airplanes which promises to remove the vexations incident to a "dead engine and no help in sight," is under test at the engine testing laboratory in the Washington Navy Yard. The device weighs approximately 30 lb. It consists essentially of a flywheel and gear train which connects through a clutch to the crankshaft of the motor. Sufficient energy can be stored in the system to turn over a standard Liberty engine five revolutions at the rate of 100 r.p.m.

The flywheel is brought up to speed by hand cranking through a train of gears until the wheel is revolving at the rate of 16,000 r.p.m. When this speed is attained the mechanism may be thrown into gear with the crankshaft by a clutch operated from the pilot's seat.

New Long Distance Scout at Anacostia

A modification of the CS1 type long distance scouting, torpedo launching and bombing plane, known as the CS2, was recently delivered to the Naval Air Station at Anacostia, D. C. The plane was flown from Mineola, L. I., as a landplane. Pontoons are now being attached, and the plane will be tested as a seaplane at the air station. There are two more CS2 planes under construction at the plant of the Curtiss Aeroplane & Motor Co., which are rapidly nearing completion. The principal distinction between the CS1 and CS2 types is that the CS2 has a greater gasoline capacity and consequently a greater operating range. The CS2 is powered with a Wright T3 engine of 585 hp., the CS1 being powered with a Wright T2 of 525 hp.

The Aircraft Service Directory

WHERE TO PROCURE EQUIPMENT AND SERVICES

Aircraft Service Directory continued

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FOR SALE—Fifty (50) new 26 x 4 Goodyear casings and tubes, $9.00 each, F.O.B. Keyport, N. J. Aeromarine Plane & Motor Co., Inc., Keyport, N. J.

WANTED—At bottom price, new JN4D or Canuck, or good used D or Canuck. Also new OX-5 motor. Martin Little, 1255 Beardsley Ave., Akron, Ohio.

FOR SALE—Seagull, with K6 Motor, excellent condition, $1700.00. Curtiss OXX6 Motor, $225.00. Box 278, AVIATION.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC. REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912 of AVIATION published weekly at Highland, New York for April 1 1924.

State of New York
County of New York

Before me, a notary public in and for the State and county aforesaid, personally appeared Geo. Newbold, who, having been duly sworn according to law, deposes and says that he is the Business Manager of AVIATION and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption required by the Act of Aug. 24, 1912, embodied in section 443, Postal Laws and Regulations, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publishers, Gardner Publishing Company, Inc., Highland, N. Y.; Editor, Ladislas d'Orcy, 225 Fourth Ave., New York City; Managing Editor, none.; Business Manager, Geo. Newbold, 225 Fourth Ave., New York City.

2. That the owner is: (If the publication is owned by an individual his name and address, or if owned by more than one individual the name and address of each, should be given below. If the publication is owned by a corporation the name of the corporation and the names and addresses of the stockholders owning or holding one per cent or more of the total amount of stock should be given.)

Gardner Publishing Company, Inc., Lester D. Gardner, 225 Fourth Ave., New York City; Earl D. Osborn, 225 Fourth Ave., New York City.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are:

Lester D. Gardner, The Gardner Motor Company, Inc.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

Geo. Newbold, Business Manager.

Sworn to and subscribed before me this 31st day of March 1924.

(Seal) JOHN C. LORENZEN

(My commission expires March 30, 1925.)

FOR SALE—Aeromarine Model 40 flying boat, new last summer, with Reed Duralumin Propeller, giving 10 per cent increased performance. Flown only 35 hours. Motor Aeromarine L6 130 HP. First class condition. Located at Curtiss Hangars, Port Washington, Long Island. Inspection invited. Address Box 275, AVIATION.

FOR SALE—Brand new Curtiss Seagull, with K-6 Motor in original crates, $1500. Post Office Box 2159, Spokane, Wash.

FOR SALE—New M.F. Flying Boats. New 220 Hispano Suiza Motors. Charles Walber, Essington, Del. Co., Pa.

FOR SALE—Sport Farman 1923 model used for demonstrating. Now being reconditioned. Price with two motors, four propellors and spares $2500.00, with one motor and no spares $1875.00. Ludington Exhibition Company, 810 Atlantic Bldg., Philadelphia.

FOR SALE: New Liberty motors and parts; state requirements. Box 274, AVIATION.

FOR SALE—New Nieuport Macchi light plane. Engine "35" Anzani. Convertible land or seaplane. Same type ship won Italian Light Plane Meet. Inspection invited. Box 279, AVIATION.

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